B.2. Results of C/I Calculations

Table B-5. C/I results of StarLynx™ GSO and Expressway™

INTERFERENCE ANALYSIS TABLE						StarLynx™ GSO vs Expressway™			
	UPLINK		DOWNLINK		UPLINK		DOWNLINK		
PARAMETER	Desired	Interfer.	Desired	Interfer.	Interfer.	Desired	Interfer.	Desired	UNITS
	Expressway™	StarLynx™ GSO	Expressway™	StarLynx™ GSO	Expressway™	StarLynx™ GSO	Expressway™	StarLynx™ GSO	
Signal frequency	46	46	38	38	46	46	38	38	GHz
+ TX Power	14.8	10.0	20.0	20.0	14.8	10.0	20.0	20.0	dBW
- TX Loss	0.5	0.5	1	0.5	0.5	0.5	1	0.5	dB
- HPA Backoff	3	1	2	2	3	1	2	2	dB
+ TX Ant. Gain	59.4	13.2	49.0	56.0	21.5	33.2	52.0	53.0	dBi
- Per Carrier Loss	0.0	0.0	10.0	15.6	0.0	0.0	10.0	15.6	dB
= Tx EIRP	70.7	21.7	56.0	57.9	32.7	41.7	59.0	54.9	dBW
- Space Loss	217.1	217.1	215.4	215.4	217.1	217.1	215.4	215.4	dB
- Atmospheric Loss	6.2	6.2	2.7	2.7	6.2	6.2	2.7	2.7	dB
+ Rx Ant. Gain	49.0	52.0	57.7	21.5	56.0	53.0	11.5	31.5	dBi
= Carrier Power (C)	-103.6		-104.4			-128.6		-131.7	dBW
= Interfer. Power (I)		-149.6		-138.7	-134.5		-147.6		dBW
- Rx Noise Temp.	28.1	28.1	26.5	26.5	28.1	28.1	25.3	25.3	dBK
- Boltzmann's Const.	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	dBW/K-Hz
- Signal Bandwidth	84.5	79.5	84.5	79.5	84.5	79.5	84.5	79.5	dB-Hz
Co/No or Io/No	12.3	-28.6	13.2	-16.2	-18.6	-7.6	-28.8	-7.9	dB/Hz
Co/Io $_{up}$ or Co/Io $_{down}$	41.0	(up)	29.3	(down)	11.0	(up)	20.9	(down)	dB
Co/Io total		29.0	(total)			10.5	(total)		dB

Table B-6. C/I results of StarLynx™ MEO and Expressway™

INTERFERENCE ANALYSIS TABLE						StarLynx™ MEO vs Expressway™			
	UPLINK		DOWNLINK		UPLINK		DOWNLINK		
PARAMETER	Desired	Interfer.	Desired	Interfer.	Interfer.	Desired	Interfer.	Desired	UNITS
	Expressway™	StarLynx™ MEO	Expressway™	StarLynx™ MEO	Expressway™	StarLynx™ MEO	Expressway™	StarLynx™ MEO	
Signal frequency	46	46	38	38	46	46	38	38	GHz
+ TX Power	14.8	10.0	20.0	17.0	14.8	10.0	20.0	17.0	dBW
- TX Loss	0.5	0.5	1	0.5	0.5	0.5	1	0.5	dB
- HPA Backoff	3	1	2	2	3	1	2	2	dB
+ TX Ant. Gain	59.4	13.2	49.0	44.3	21.5	33.2	52.0	41.3	dBi
- Per Carrier Loss	0.0	0.0	10.0	12.6	0.0	0.0	10.0	12.6	dB
= Tx EIRP	70.7	21.7	56.0	46.2	32.7	41.7	59.0	43.2	dBW
- Space Loss	217.1	217.1	215.4	204.5	206.1	206.1	215.4	204.5	dB
- Atmospheric Loss	6.2	6.2	2.7	2.7	6.2	6.2	2.7	2.7	dB
+ Rx Ant. Gain	49.0	52.0	57.7	21.5	44.3	41.3	11.5	31.5	dBi
= Carrier Power (C)	-103.6		-104.4			-129.3		-132.4	dBW
= Interfer. Power (I)		-149.6		-139.5	-135.3		-147.6		dBW
- Rx Noise Temp.	28.1	28.1	26.5	26.5	28.1	28.1	25.3	25.3	dBK
- Boltzmann's Const.	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	dBW/K-Hz
- Signal Bandwidth	84.5	79.5	84.5	79.5	84.5	79.5	84.5	79.5	dB-Hz
Co/No or Io/No	12.3	-28.6	13.1	-16.9	-19.4	-8.4	-28.8	-8.6	dB/Hz
Co/Io $_{up}$ or Co/Io $_{down}$	41.0	(up)	30.0	(down)	11.0	(up)	20.2	(down)	dB
Co/Io total		29.7	(total)			10.5	(total)		dB

Table B-7. C/I results of StarLynx™ GSO and StarLynx™ MEO

INTERFERENCE ANALYSIS TABLE					StarLynx™ GSO vs StarLynx™ MEO				
	UPLINK		DOWNLINK		UPLINK		DOWNLINK		
PARAMETER	Desired	Interfer.	Desired	Interfer.	Interfer.	Desired	Interfer.	Desired	UNITS
	StarLynx™ MEO	StarLynx™ GSO	StarLynx™ MEO	StarLynx™ GSO	StarLynx™ MEO	StarLynx™ GSO	StarLynx™ MEO	StarLynx™ GSO	
Signal frequency	46	46	38	38	46	46	38	38	GHz
+ TX Power	10.0	10.0	17.0	20.0	10.0	10.0	17.0	20.0	dBW
- TX Loss	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	dB
- HPA Backoff	1	1	2	2	1	1	2	2	dB
+ TX Ant. Gain	33.2	13.2	41.3	56.0	13.2	33.2	44.3	53.0	dBi
- Per Carrier Loss	0.0	0.0	12.6	15.6	0.0	0.0	12.6	15.6	dB
= Tx EIRP	41.7	21.7	43.2	57.9	21.7	41.7	46.2	54.9	dBW
- Space Loss	206.1	206.1	204.5	215.4	217.1	217.1	204.5	215.4	dB
- Atmospheric Loss	6.2	6.2	2.7	2.7	6.2	6.2	2.7	2.7	dB
+ Rx Ant. Gain	41.3	44.3	31.5	11.5	56.0	53.0	11.5	31.5	dBi
= Carrier Power (C)	-129.3		-132.4			-128.6		-131.7	dBW
= Interfer. Power (I)		-146.3		-148.7	-145.6		-149.4		dBW
- Rx Noise Temp.	28.1	28.1	25.3	25.3	28.1	28.1	25.3	25.3	dBK
- Boltzmann's Const.	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	dBW/K-Hz
- Signal Bandwidth	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5	dB-Hz
Co/No or Io/No	-8.4	-25.4	-8.6	-24.9	-24.6	-7.6	-25.6	-7.9	dB/Hz
Co/Io $_{up}$ or Co/Io $_{down}$	17.0	(up)	16.2	(down)	17.0	(up)	17.8	(down)	dB
Co/Io total		13.6	(total)			14.4	(total)		dB

Table B-8. C/I results of StarLynx™ GSO and StarLynx™ GSO

INTERFERENCE ANALYSIS TABLE					StarLynx™ GSO vs StarLynx™ GSO				
	UPLINK		DOWNLINK		UPLINK		DOWNLINK		
PARAMETER	Desired	Interfer.	Desired	Interfer.	Interfer.	Desired	Interfer.	Desired	UNITS
	GSO	GSO	GSO	GSO	GSO	GSO	GSO	GSO	
Signal frequency	46	46	38	38	46	46	38	38	GHz
+ TX Power	10.0	10.0	20.0	20.0	10.0	10.0	20.0	20.0	dBW
- TX Loss	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	dB
- HPA Backoff	1	1	2	2	1	1	2	2	dB
+ TX Ant. Gain	33.2	13.2	53.0	56.0	13.2	33.2	56.0	53.0	dBi
- Per Carrier Loss	0.0	0.0	15.6	15.6	0.0	0.0	15.6	15.6	dB
= Tx EIRP	41.7	21.7	54.9	57.9	21.7	41.7	57.9	54.9	dBW
- Space Loss	217.1	217.1	215.4	215.4	217.1	217.1	215.4	215.4	dB
- Atmospheric Loss	6.2	6.2	2.7	2.7	6.2	6.2	2.7	2.7	dB
+ Rx Ant. Gain	53.0	56.0	31.5	11.5	56.0	53.0	11.5	31.5	dBi
= Carrier Power (C)	-128.6		-131.7			-128.6		-131.7	dBW
= Interfer. Power (I)		-145.6		-148.7	-145.6		-148.7		dBW
- Rx Noise Temp.	28.1	28.1	25.3	25.3	28.1	28.1	25.3	25.3	dBK
- Boltzmann's Const.	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	dBW/K-Hz
- Signal Bandwidth	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5	dB-Hz
Co/No or Io/No	-7.6	-24.6	-7.9	-24.9	-24.6	-7.6	-24.9	-7.9	dB/Hz
Co/Io $_{up}$ or Co/Io $_{down}$	17.0	(up)	17.0	(down)	17.0	(up)	17.0	(down)	dB
Co/Io total		14.0	(total)			14.0	(total)		dB

B.3. SATELLITE DIVERSITY ANALYSES

Interference is measured by the level of interference-to-noise-ratio (Io/No) in dB where Io is the interference level from the interfering satellite link and N_o is the noise level at the receiver (satellite for the uplink and Earth station for the downlink). Orbital parameters for both GSO and MEO components of StarLynx™ are listed in Table B-9. For a user terminal located at 0° latitude, Figure B-2 shows the Io/No results between StarLynx™ GSO (S-GSO) and StarLynx™ MEO (S-MEO) in three cases: (1) the user terminal tracks the satellite with the highest elevation angle, (2) the user terminal tracks a satellite until it drops below 30° elevation angle, and (3) the user terminal tracks the satellite with the least interference (satellite diversity implementation). In-line situation would cause harmful interference in cases (1) and (2) (no interference mitigation). In case 3 (with interference mitigation), the worst case (highest Io/No) is reduced by a significant amount. In conclusion, the use of satellite diversity reduces Io/No by a significant level depending on user terminal locations.

Table B-9. StarLynx™ GSO and MEO Orbital Parameters

	StarLynx™ GSO	StarLynx™ MEO
Number of Planes	1	4
Number of Satellites Per Plane	8	5
Altitude	35787 km	10352 km
Inclination	0°	55°
Plane Phasing	0°	0°
Orbit Period	24 hr	6 hr

Detailed interference analyses for user terminals at other latitudes were also performed. The most severe interference cases (highest Io/No values) from 0° to 70° latitude are shown in Figure B-3. The analytical results again demonstrate that the constellation design of StarLynx™ MEO with satellite diversity reduces Io/No by a significant level. Based on this analysis, sharing of the same spectrum between GSO and NGSO satellites should be facilitated.

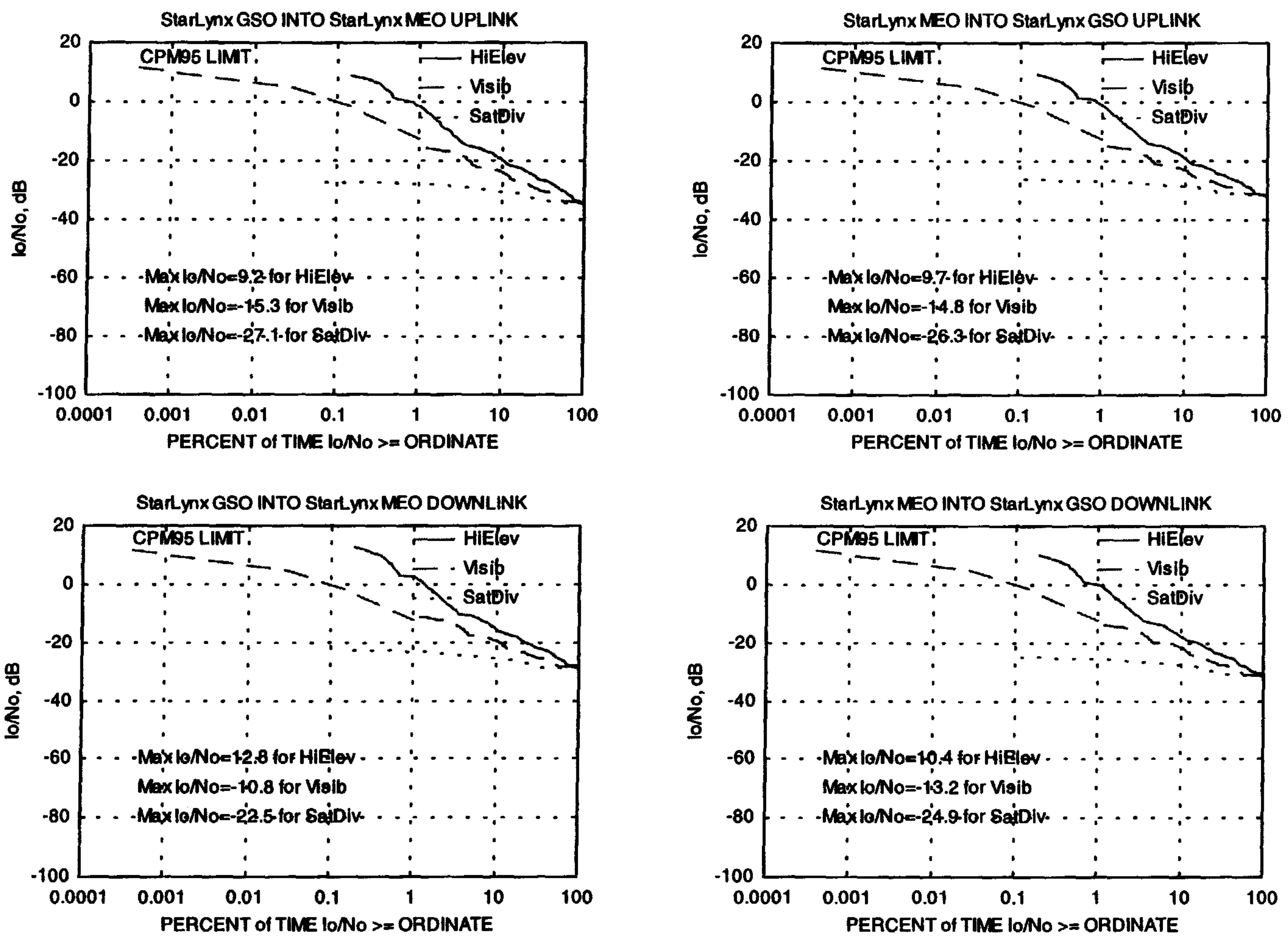
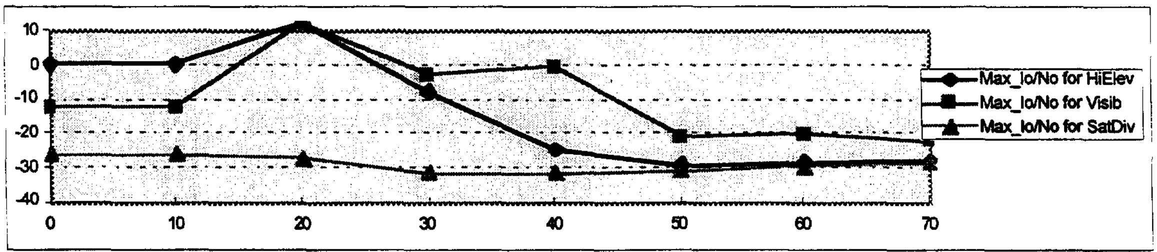


Figure B-2. Interference Simulation Results between StarLynx™ GSO and StarLynx™ MEO Using Satellite Diversity (User Terminal Location at 10° Latitude)

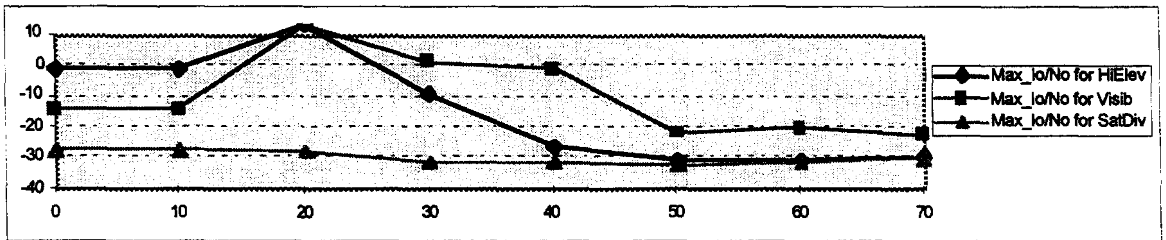
StarLynx MEO INTO StarLynx GSO DOWNLINK

Latitude	0	10	20	30	40	50	60	70
Max_Io/No for HiElev	0.4	0.4	13.1	-7.8	-24.5	-28.8	-28.3	-27.4
Max_Io/No for Visib	-12.1	-12.1	13.1	-2.6	0	-20.8	-19.7	-21.6
Max_Io/No for SatDiv	-25.6	-25.6	-27.1	-31.1	-31.1	-30.6	-29.4	-28.3



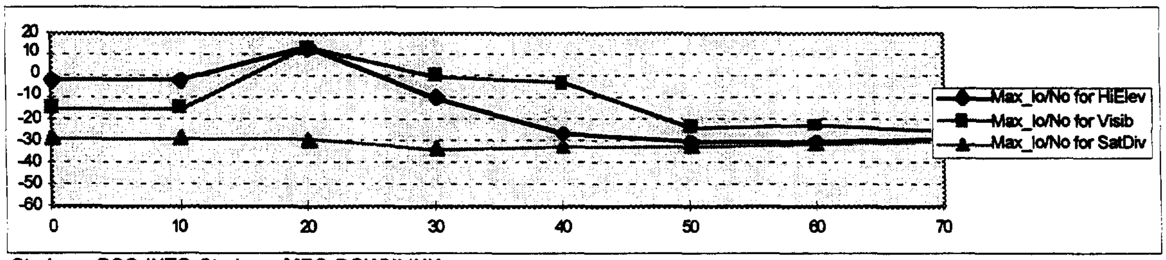
StarLynx MEO INTO StarLynx GSO UPLINK

Latitude	0	10	20	30	40	50	60	70
Max_Io/No for HiElev	-1.1	-1.1	13.7	-9.1	-26.3	-30.7	-30.2	-29.1
Max_Io/No for Visib	-13.7	-13.7	13.7	1.3	-1	-21.7	-20.4	-22.5
Max_Io/No for SatDiv	-26.7	-26.7	-28	-31.2	-31.4	-31.6	-31.3	-29.8



StarLynx GSO INTO StarLynx MEO UPLINK

Latitude	0	10	20	30	40	50	60	70
Max_Io/No for HiElev	-1.5	-1.5	12.9	-10.1	-26.4	-30.4	-30	-29.4
Max_Io/No for Visib	-14.2	-14.2	12.9	0.1	-2.8	-23.5	-22.6	-24.3
Max_Io/No for SatDiv	-28	-28	-29.8	-33.1	-32.8	-32.1	-31	-30.1



StarLynx GSO INTO StarLynx MEO DOWNLINK

Latitude	0	10	20	30	40	50	60	70
Max_Io/No for HiElev	2.8	2.8	15.5	-5.4	-22.1	-26.4	-25.9	-25
Max_Io/No for Visib	-9.7	-9.7	15.5	5	2.4	-18.4	-17.3	-19.2
Max_Io/No for SatDiv	-23.2	-23.1	-24.7	-28.7	-28.7	-28.2	-27	-25.9

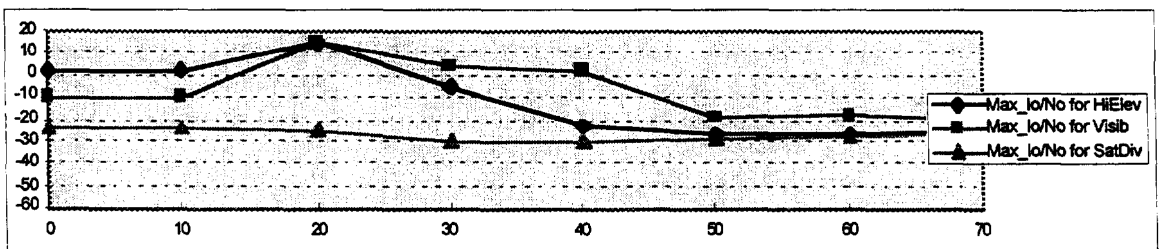


Figure B-3. Worst-Case Interference (Io/No) as a Function of Latitudes

B.4 INTRA SERVICE SHARING

B.4.1 Mobile-Satellite and Fixed-Satellite Services

B.4.1.1 StarLynx™ GSO with Other GSO FSS/MSS Analysis

Between two GSO systems, interference mitigation is achieved with orbital separation. Earth station antenna discrimination is a primary factor in interference mitigation between two GSO systems. The StarLynx™ user terminal will use array beam formation technique to achieve 20 dB or higher antenna discrimination from a GSO satellite spaced 2° away from a StarLynx™ GSO satellite. Analysis shows that StarLynx™ GSO can achieve sufficient interference protection from a hypothetical GSO system.

B.4.1.2 StarLynx™ MEO with other GSO FSS/MSS Analysis

Simulation results in Section B.3 show that satellite diversity provides an interference mitigation technique that facilitates spectrum sharing between StarLynx™ MEO and GSO systems. Table B-10 lists interference mitigation techniques to be used by StarLynx™ MEO to avoid excessive interference with GSO systems. This list shows techniques which have special applicability to NGSO systems. Sharing between GSO and NGSO systems depends on appropriate implementation of some or all of these techniques by the NGSO systems.

Table B-10. NGSO Interference Mitigation Techniques

TECHNIQUE for INTERFERENCE MITIGATION	APPLIED in StarLynx™
Satellite Diversity	Applied
Restricted Operational Elevation Angles	Applied
High Gain Antenna	Applied
Adaptive Power Control	Applied
Network Traffic Management	Applied
Hybrid System	Applied
Repeatable Ground Tracks for NGSO	Applied
Code Division	Applied

B.4.1.3 StarLynx™ GSO with NGSO FSS/MSS Analysis

The potential for harmful interference from the GSO uplink to NGSO uplink for co-located Earth stations is minimized if various interference mitigation techniques described in Table B-10 are applied.

B.4.1.4. StarLynx™ MEO with Other NGSO FSS/MSS Analysis

To achieve the most efficient spectrum usage, NGSO systems should cooperatively implement interference mitigation techniques. Multiple NGSO systems operating in a co-directional, co-frequency manner can be accomplished using various techniques listed in Table B-8. This section examines the use of satellite diversity to reduce interference and facilitate sharing between two NGSO systems.

Satellite diversity relies on a high percentage of multiple satellites visible to an Earth terminal, and the Earth terminal being able to perform high speed switching between visible satellites. However, switching is a basic requirement in NGSO satellite hand-over. Thus, additional resources are not imposed upon the Earth terminal to apply satellite diversity, except for the addition of a dynamic interference source location estimation package.

Figure B-4 shows results from a simulation that dynamically locates satellites in their orbits and allows each Earth terminal to track its respective aiming points while taking into account the Earth's rotation. The simulation sampled over a period of seven days at a relatively fine sampling resolution (2 sec). Assuming the adaptive power control technique is applied to both systems, the dynamic interference-to-noise level, Io/No, for both uplink and downlink at both systems are determined.

Table B-11 shows the orbital parameters for StarLynx™ MEO and a proposed NGSO system using the same frequency band. The results in Figure B-4 show that by applying satellite diversity, the Io/No between StarLynx™ MEO and the other NGSO system can be reduced by a significant level. Based on this analysis, sharing of the same spectrum between NGSO satellites should be facilitated.

Table B-11. StarLynx™ MEO and a Proposed NGSO System Orbital Parameters

	StarLynx™ MEO	Proposed NGSO
Number of Planes	4	12
Number of Satellites Per Plane	5	6
Altitude	10352 km	1350 km
Inclination	55°	47°
Plane Phasing	0°	25°

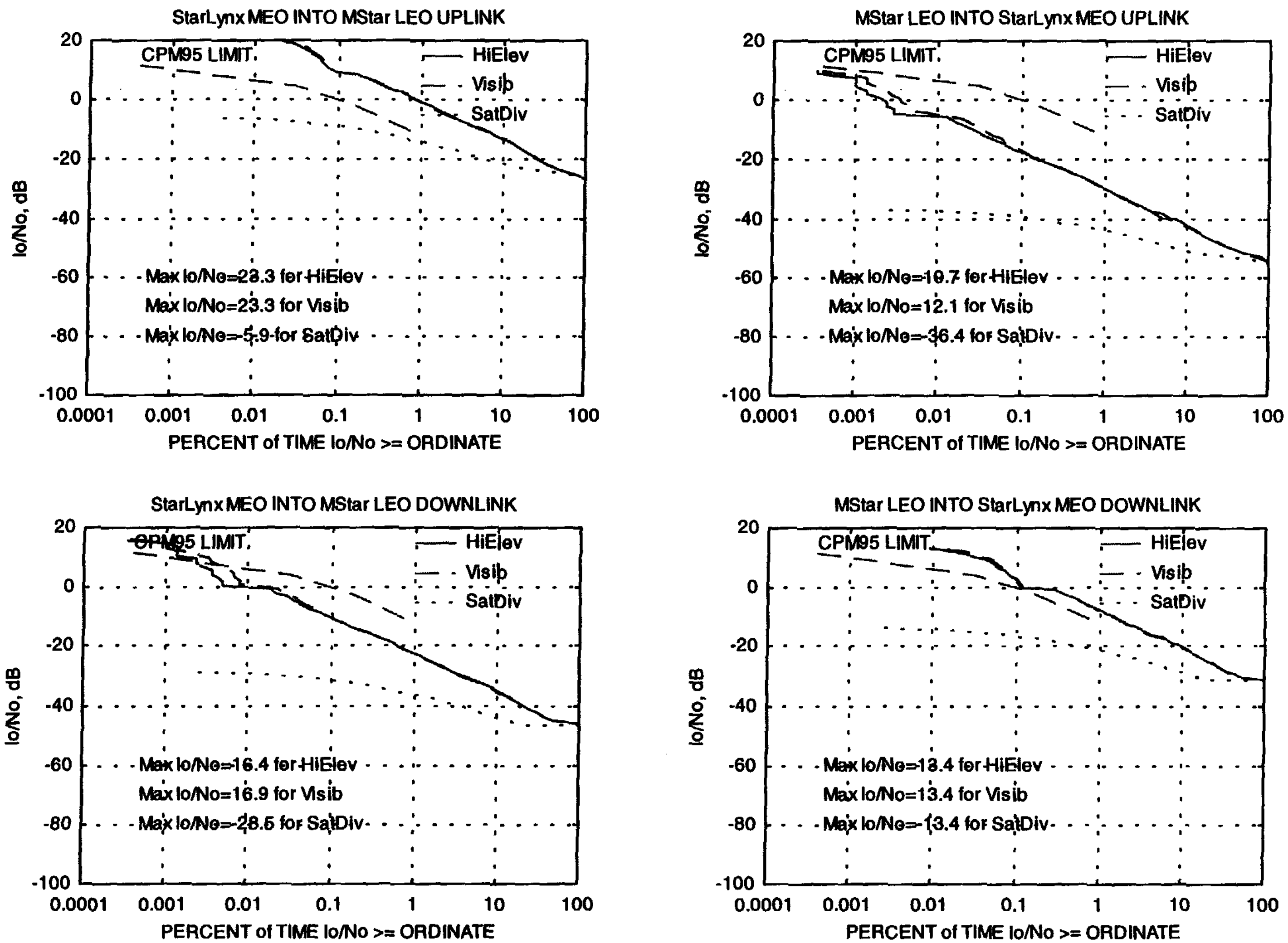


Figure B-4. Interference Simulation Results between StarLynx™ MEO and a Proposed NGSO System Using Satellite Diversity (User Terminal Location at 40° Latitude)

Appendix C
Antenna Coverage

APPENDIX C: COVERAGES

C.1 Service Coverage for StarLynx™ Satellites

Figures C-1 and C-2 illustrate the fields-of-view (FOV) at 30° elevation angle contour for StarLynx™ MEO and GSO satellites, respectively. With 20 satellites, StarLynx™ MEO will provide virtually complete global coverage with a high percentage of dual satellite coverage.

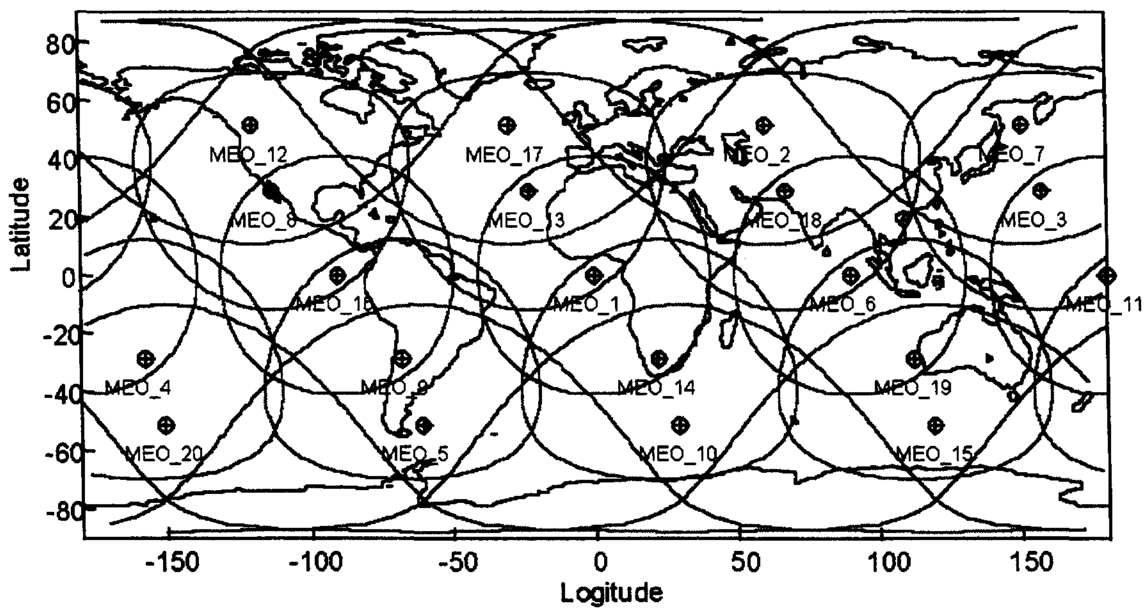


Figure C-1. Field of View for StarLynx™ MEO Satellites

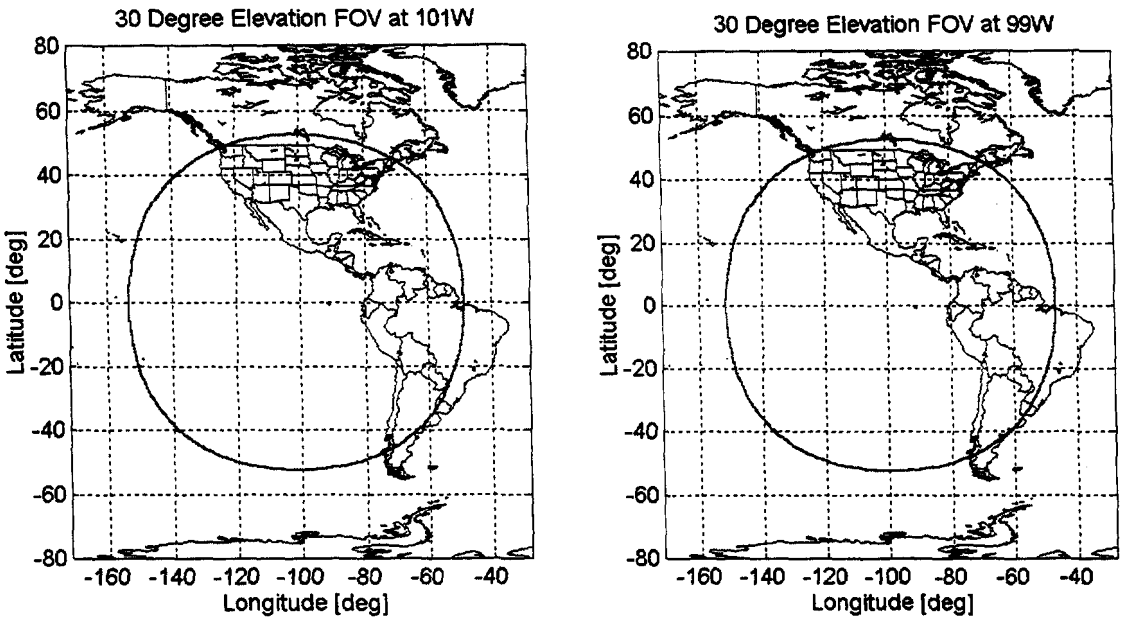


Figure C-2. Field of View for StarLynx™ GSO Satellites

C.2 Elevation Angle Contours for StarLynx™ Satellites

Figure C-3 shows elevation angle contours for a StarLynx™ MEO satellite when it covers the continental United States (CONUS). Contours are shown in increments of 10° starting with 60° as the inner most contour, with a cutoff at the minimum 30° elevation angle. Figure C-4 shows elevation angle contours for the StarLynx™ GSO satellite at 101° W. As Figure C-3 and Figure C-4 indicate, both the MEO and GSO satellites cover all of CONUS when their subsatellite longitudes are near the center of CONUS.

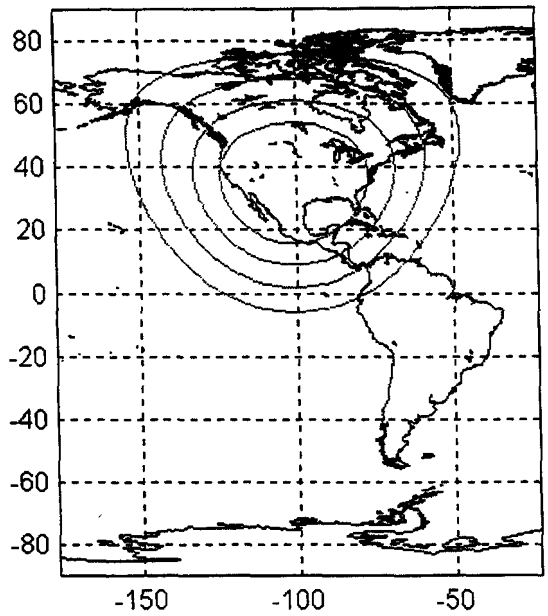


Figure C-3. Elevation Angle Contours for StarLynx™ MEO Satellite Over CONUS

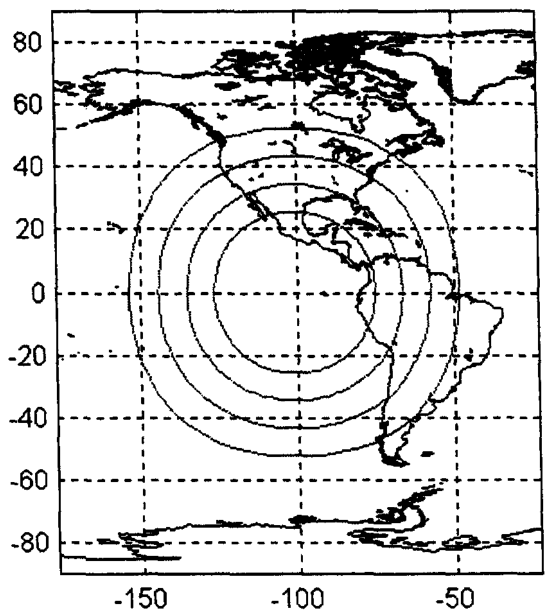


Figure C-4. Elevation Angle Contours for StarLynx™ GSO Satellites

C.3 ANTENNA SPOT BEAM PATTERN FOR STARLYNX™ SATELLITES

Figure C-5 shows a plot of the antenna spot beam pattern for a StarLynx™ MEO satellite over CONUS. Figure C-6 shows the antenna spot beam pattern for a StarLynx™ GSO satellite over CONUS. At any one time, up to 40 spot beams per GSO satellite and 32 spot beams per MEO satellite will be illuminated. Because up to three MEO satellites and four GSO satellites can be in view over the U.S., a total of over 250 spot beams can be simultaneously utilized for U.S. service.

The MEO satellites have steerable beams, which can serve any area within a satellite's field of view. The beam areas can be maintained during satellite motion or adjusted at any time. Accordingly, the MEO satellites can provide service to any area desired. The GSO satellites also have scanning beam capabilities to ensure ubiquitous U.S. service.

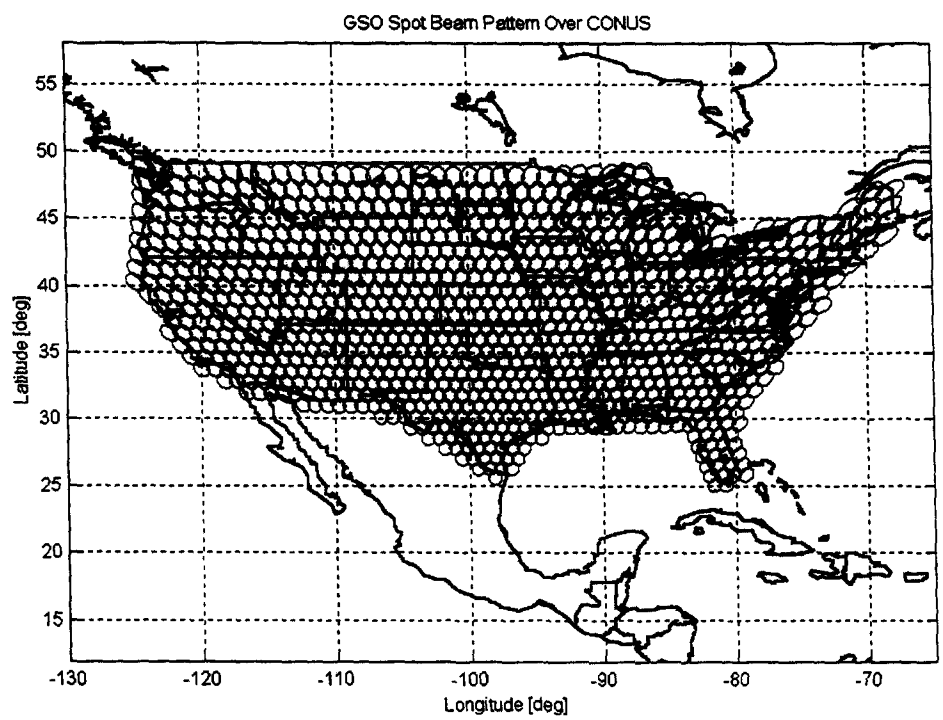
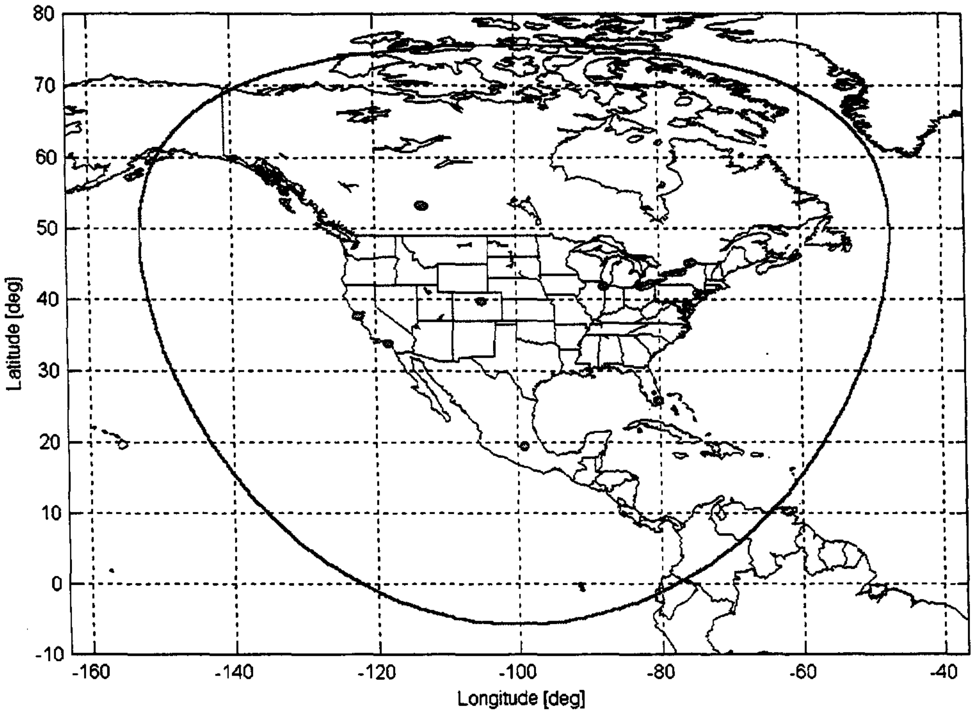
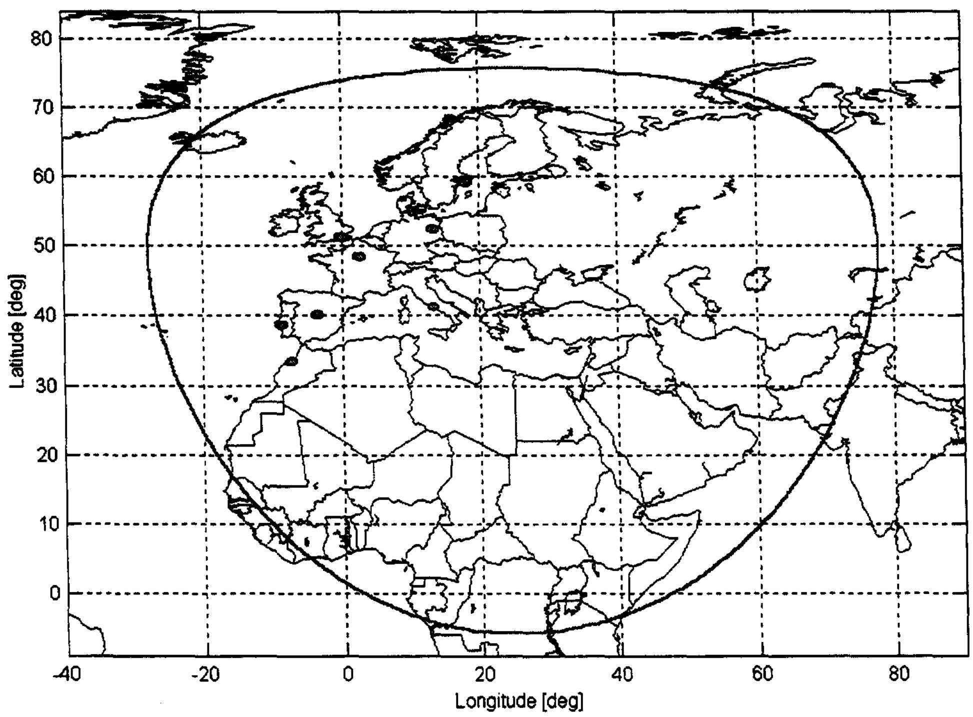


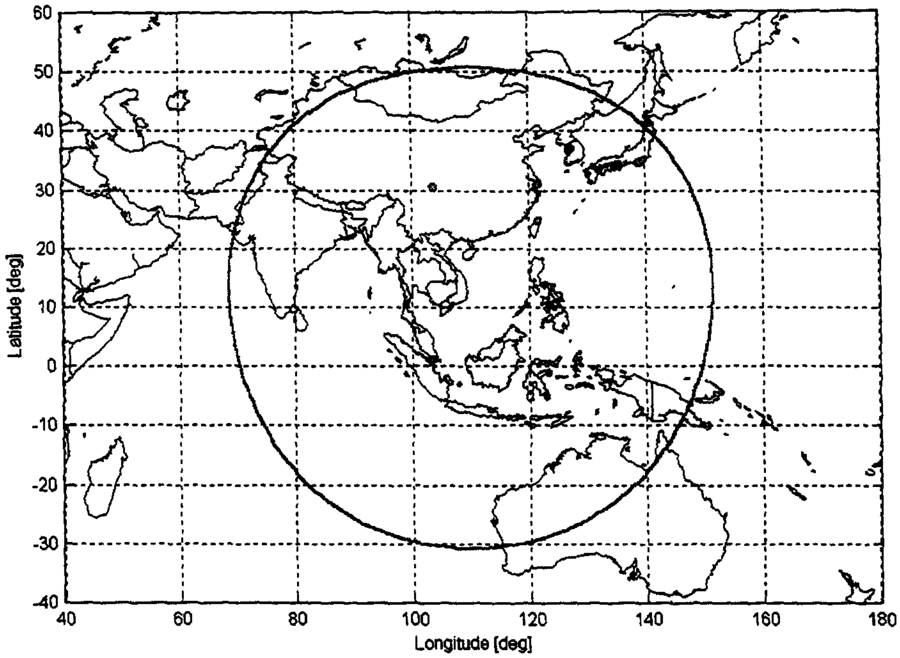
Figure C-5. Illustrative Spot Beam Pattern for a StarLynx™ MEO Satellite



(a) North America



(b) Europe



(c) Asia

Figure C-6. Example StarLynx™ MEO Spot Beam Coverage Over (a) North America, (b) Europe, and (c) Asia

C.4. ANTENNA CONTOUR PLOTS FOR STARLYNX™ SATELLITES

Figures C-7 shows antenna contours for StarLynx™ GSO satellites.

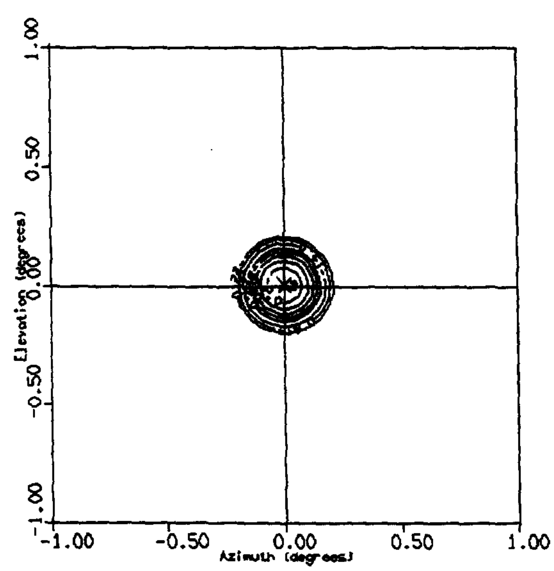
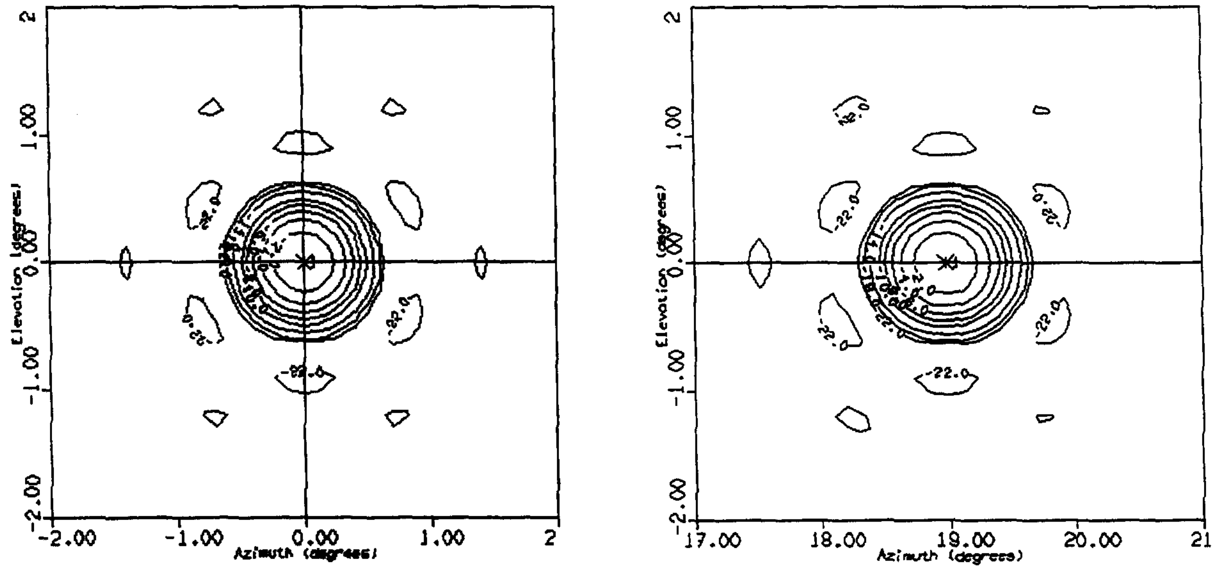


Figure C-7. Transmit/Receive Beam Contours for StarLynx™ GSO Satellite

(G_{max}= 56 dBi, G/T_{max}=27.9 dB/_K)

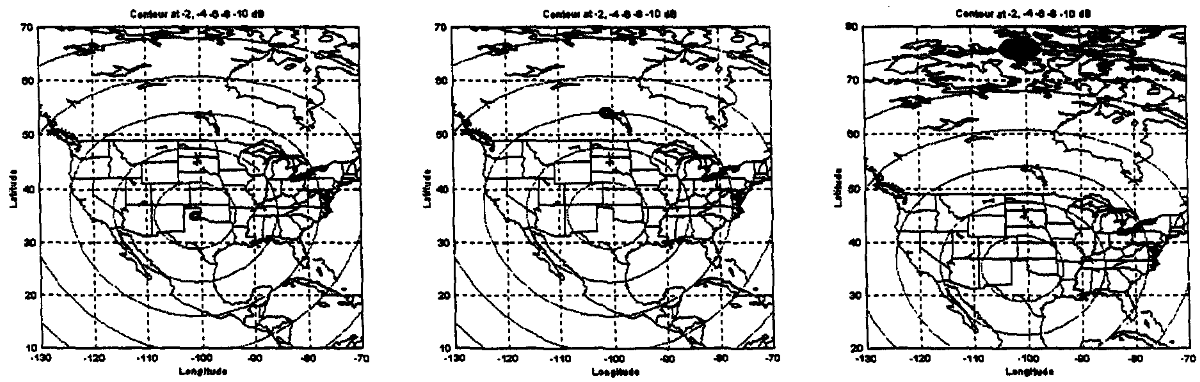
Figures C-8 (a) and C-8 (b) show antenna contours for StarLynx™ MEO satellites, with G_{max} = 44.3 dBi, G/T_{max} = 16.2 dB/K.



(a) Boresight Beam (b) Non-Boresight Beam

Figure C-8. Transmit/Receive Beam Contours for StarLynx™ MEO Satellite Phased Array Beams (G_{max} = 44.3 dBi, G/T_{max} = 16.2 dB/K)

Figure C-9 (a) shows antenna contours of a spot beam in the nadir direction. Figure C-9 (b) shows antenna contours of a spot beam midway between nadir and the edge of coverage, delineated by the 30° elevation angle contour. Figure C-9 (c) shows antenna contours of a spot beam at the edge of coverage.



(a) Nadir Beam (b) Mid Field of View Beam (c) Edge of Coverage Beam

Figure C-9. Beam Contours for a StarLynx™ MEO Satellite Over CONUS

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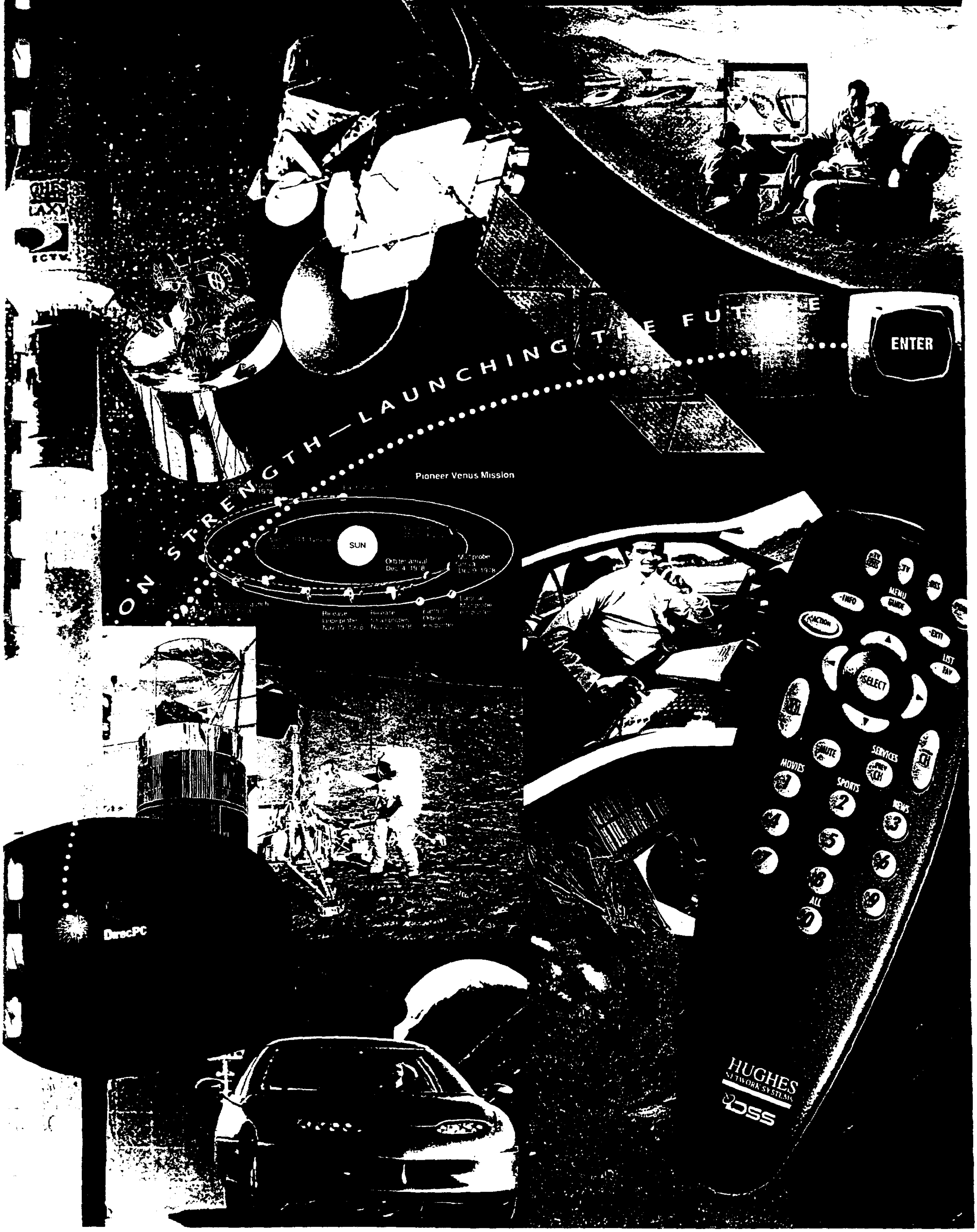
Appendix D
Financial Report

APPENDIX D: FINANCIAL REPORT

Hughes Electronics Corporation 1996 Annual Report



HOWARD HUGHES
Pioneer Howard Hughes founded Hughes Aircraft Company in 1932. Two years later he set his first aircraft speed record in the "H-1 racer." In 1938, the aviation pioneer and his crew were the first to fly non-stop around the world.

FALCON MISSILE
The world's first air-to-air, radar-guided missile was Hughes' Falcon. The company produced more than 50,000 Falcons between 1952 and 1963.

LASER
In 1960, Hughes scientists achieved the first successful operation of a ruby laser, a breakthrough hailed as one of this century's most important engineering achievements.

PIONEER VENUS
The first extensive mapping of Venus using radar was a major achievement of the Pioneer Venus space mission, which began in 1978. Hughes built the orbiting spacecraft and the probe that carried the instruments to collect data for the National Aeronautics & Space Administration.

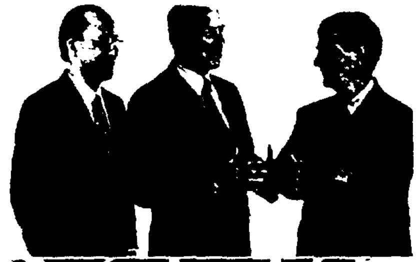
SYNCOM
Hughes launched the world's first synchronous satellite in 1963. Syncom transmitted the first high-quality voice message between two U.S. Navy ships on opposite sides of the Atlantic Ocean and paved the way for the commercial satellite communications industry.

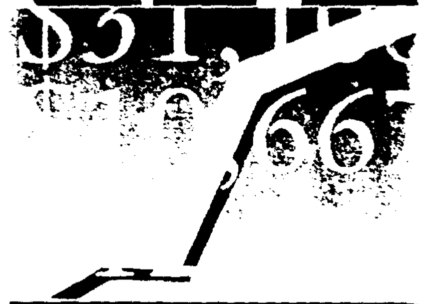
RADAR
The first tactical air-to-air fire-control radar, delivered in 1949 to the U.S. Air Force, was named the "Hughes E-1." This innovative new radar enabled a pilot to fire at a target he could not see.

GM SUNRAYCER
Hughes' advanced solar energy technologies were vital components of the GM Sunraycer, an innovative solar-powered electric General Motors vehicle that in 1987 won the grueling 1,950 mile World Solar Challenge race across Australia.

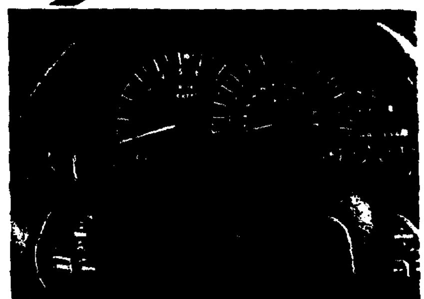
SURVEYOR 1
In 1966, Hughes' unmanned Surveyor 1 was the first spacecraft to make a controlled, soft landing on the moon. Hughes designed and built seven Surveyor spacecraft, which led the way for future manned landings.

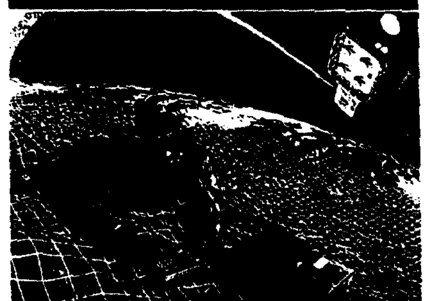
DIRECTV
Hughes launched DIRECTV®, the nation's first high-powered digital direct broadcast satellite television service, in 1994. Customers receive signals with the DSS® system, which features an 18-inch satellite dish, receiver unit and remote control.

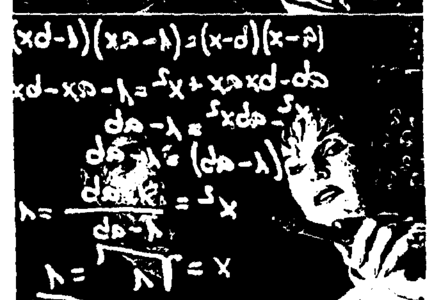


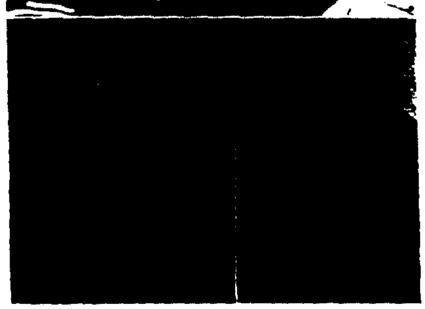


Hughes Electronics Corporation, a subsidiary of General Motors Corporation, designs, manufactures and markets advanced electronics equipment and services. The markets for the company's products and services are undergoing dramatic changes, and to remain a financial, market and technology leader, Hughes must change, too. This annual report, following the theme of Building on Strength – Launching the Future, reviews the strengths of Hughes Aircraft Company, Delco Electronics and the Telecommunications & Space companies, and outlines opportunities and plans for these operations.









Message to Shareholders

Building on Strength...LAUNCHING THE FUTURE

Most annual reports offer a look back – a survey of the year that was. For Hughes Electronics, this report marks a major change in our company. Not only does it outline a year of goals met and gains made; it also describes the substantial strengthening of our business segments and the unlocking of shareholder value expected from three significant transactions.

It's become a cliché to note the pace of change in our global economy. Yet if our competitive environment is teaching us any lessons at all, it is that it's not enough to lead the market of the moment. To stay on top, a company has to see over-the-horizon: to anticipate the changes and challenges ahead, to see – before others see them – not just obstacles but opportunities. That is the key reason Hughes Electronics made its decision to look beyond its success in today's markets, to restructure and refocus itself for the future.

On January 16, 1997, GM, Hughes and Raytheon announced their plan, pending final government and shareholder approvals, to: 1) spin off Hughes Aircraft Company (HAC), after which it will merge with Raytheon; 2) transfer Delco Electronics to GM's Delphi Automotive Systems; and 3) recapitalize GM's Class H common stock – creating a new tracking stock linked to the performance of Hughes Electronics' telecommunications and space businesses.

That's the "what." As for the "why" behind the transactions, we must simply look to the competitive market around us. 1996 saw the continued post-Cold War consolidation of the defense sector, driven by more downward pressure on defense procurement that has cut the overall defense budget in half since the height of the 1980's buildup. A new wave of mega-mergers is redefining the meaning of critical mass, such that we believed the best future for HAC was in combination with another industry leader. HAC's merger with Raytheon offers our customers a stronger critical mass of programs, skills and investment that will be sustainable while enabling reduced costs. The merger should also offer GMH shareholders excellent value in the face of the defense industry's restructuring.

Just as the defense sector dictated the need for redefinition, the evolu-

"We look forward to a more focused participation in the Information Age with the excitement that comes from having both the technology and the services that satisfy market needs."

left to right:

Charles H. Noski
Vice Chairman and
Chief Financial Officer

C. Michael Armstrong
Chairman of the Board and
Chief Executive Officer

Michael T. Smith
Vice Chairman

tion of the automotive electronics industry also dictated change. Customers' desire for systems rather than separate components created a natural alliance for Delco and Delphi – opportunities in combination that neither alone could seize. Delco/Delphi will possess capabilities unmatched in the automotive electronics industry, a single entity possessing the breadth and potential to deliver integrated systems at the lowest cost.

Finally, the transactions enable us to take our telecommunications and space businesses to a new level – a chance to bring significantly greater financial resources and a sharper focus of our management, talent and technology to the emerging markets for space and satellite communications. This is an important step as we work to realize our vision of a Wireless Expressway™ – an Information Skyway – using space and satellites to offer instant, affordable and ubiquitous delivery of data, voice and video.

We look forward to a more focused participation in the Information Age with the excitement that comes from having both the technology and the services that satisfy market needs – and a price performance that sets us apart.

• In satellites: we will introduce the most capable, powerful and versatile satellite family in the industry with the launch of our HS 702.

• In networks, we will appeal to a wider Internet user base as we continue to drive down the costs of Turbo Internet™, a satellite-based interactive Internet service that provides speeds 14 times more rapid than today's telephone lines.

• In our soon-to-be-completed merger with PanAmSat, we will expand our global capacity by more than 70% in the next couple of years as we bring needed communications infrastructure to a world evolving toward a single market.

• In DIRECTV®, we will introduce PC-based services that bring access to the Internet, DIRECTV programming, a menu of Web sites and multi-media magazines – all to a single dish serving both your television and personal computer.

• Internationally, Galaxy Latin America will expand its coverage to include all of the 90 million television households of Latin America and the Caribbean, while the expected launch within a year of DIRECTV Japan will take our direct-to-home service to a country that is only 4% cable-penetrated, yet is mature in its interest in entertainment, information and education.

"Using technology, talent and investment to lead in markets, to build new businesses, to create new value: that's what the new Hughes Electronics will be all about."

BUILDING ON STRENGTH...Launching the Future

For Hughes Electronics, 1996 marked a year of goals met and ground gained, paving the way for the transactions announced in January 1997.

Aerospace and Defense Systems:

For the year, Hughes Aircraft Company reported a nearly 7% increase in revenues, to $6.3 billion. Equally important, HAC maintained its double-digit margins, as well as a sizable $8.2 billion backlog in missiles, sensors and information systems and services. In the downsized defense procurement environment, HAC posted an impressive 77% win ratio for the competitions it entered. Finally, in the key area of international growth, 1996 saw an increase of 80% for international orders.

Automotive Electronics:

Delco Electronics ended 1996 retaining its industry lead in market share, while posting a 20% rise in international and non-GM North American Operations sales. A fourth-quarter